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WEATHER, CLIMATE AND TOURISM
A Geographical Perspective

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Abstract: This paper examines the relationship among climate, weather, and tourism from the perspective of the geography of tourism and climatology. It analyzes the nature of the influence that climate has on tourism and recreation, stressing the need to improve upon the simplistic descriptions traditionally reported in planning projects, which are often unconnected to the requirements of tourism, and revealing the links that atmospheric elements maintain with different facets of this industry. Specifically, the paper considers the influence that climate and weather exert on the geographical space, demand, supply, and market agents of the tourism system. It also shows the significance of this relationship in the context of climate change. **Keywords:** climate, weather, tourism and recreational activities, planning, geography. © 2005 Elsevier Ltd. All rights reserved.

Résumé: Temps, climat et tourisme: une perspective géographique. Cet article examine la relation entre climat, temps et tourisme des perspectives de la géographie du tourisme et de la climatologie. L'article analyse la nature de l'influence du climat sur le tourisme et la récréation en insistant sur le besoin de faire mieux que les descriptions simplistes qui se trouvent habituellement dans les projets de planification et qui sont souvent sans rapport aux exigences du tourisme, afin de révéler la relation entre les éléments atmosphériques et les différentes facettes de l'industrie touristique. En particulier, l'article considère l'influence que le climat et le temps exercent sur l'espace géographique, la demande, l'offre et les concessionnaires opérant sur le marché du système de tourisme. **Mots-clés:** climat, temps, activités de tourisme et de récréation, planification, géographie. © 2005 Elsevier Ltd. All rights reserved.

INTRODUCTION

The relationship between climate and tourism has traditionally been studied by two branches of geography: geography of tourism and climatology. Both show how climate and weather support tourist activities. The first also contributes to decisions on where to locate tourism centers. It highlights the importance of these parameters in the tourist experience and in the phases that immediately precede and follow it. Additionally, this branch of geography stresses the need to analyze the tourism potential of the atmospheric conditions in areas of interest, so that the information might be made available for planning in

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the tourism industry. On the other hand, the study of climate, its variations in time and space, and its relationship with human activity provides the methods and techniques needed to analyze the environmental conditions to plan tourism areas.

This paper is part of a larger research project that examines the relationships between climate and tourism from the perspective of both branches of geography (Gómez Martín 2000). It analyzes the nature of these relationships, stressing the need to improve upon the simplistic descriptions traditionally reported in planning projects, and identifying the main lines of research to be developed in the future.

WEATHER, CLIMATE AND TOURISM

Weather can be defined as the state of the atmosphere in a given place at a given time, and can be described for one particular weather station or for a specific area of the earth's surface. By contrast, climate is the prevailing condition of the atmosphere deduced from long periods of observation. Thus, the knowledge of the latter is directly determined by the knowledge of the former; climate is a generalization while weather reflects a particular event. To speak of the *climate* is to speak in an abstract way since it is its elements that allow characterizing it. The elements of the climate are the components that define it and they are, at the same time, the variables through which it influences the other elements of the natural and human environments. Its elements that have the greatest influence on tourism are temperature, number of sun hours, precipitation, wind, humidity, and fog. This paper uses climate as this set of interrelated elements as they influence the natural and human environments.

People are well aware of how weather and climate influence their lives, just as they also observe how much some of these activities affect the atmosphere. Clearly, economic activities are affected by and influence climate and weather and, of these, outdoor ones, like tourism, are a case in point. Tourism can be defined as

> movement in space undertaken by man in order to use other spaces as places of leisure. Tourists wish to enjoy the different geophysical resources or attractions offered by the place they have traveled to, or observe the genealogical elements contained therein; that is, they want to admire the historical remains with a certain monumental, historical or cultural value that survive in the area (Sánchez 1985:104).

Tourism, therefore, requires and uses a geographical space. This space has a physical substrate, the natural environment, consisting of physical and biological elements (its climate, geology, topography, flora and fauna, etc.); and also has elements created by human activities. This geographical space (and its constituent elements, including climate) can act simultaneously as a factor influencing the location of tourism, as a resource supporting a wide range of activities, and as an attraction in its own right.

Climate as a Factor of Location for Tourism

Every economic activity requires a territorial base, and this applies to geographical space acting as a support for tourist activities. However, this does not mean that it plays a neutral role in the social and economic processes that are operative. The kind of terrain in the support area also influences where activities are carried out. Thus, tourist activities are not distributed homogeneously in space; rather, certain activities are concentrated in specific points or areas. Numerous factors account for this pattern, in keeping with the varied and complex nature of tourism itself.

Both economic and other factors influence where tourism is located, although the former dominates in most decisions concerning location. Two classes of economic factors can be highlighted (Butler 1986): spatial and environmental. The former are associated with distance, accessibility, transport costs, the presence of markets, the concentration of economic activities, land prices, and competition with other activities, while the latter are associated with natural and cultural variations from one place to another. Natural environmental factors that are particularly prone to variation are climate, geology, hydrology, soil, topography, fauna, and natural vegetation. Cultural environmental factors include archaeological remains, historical monuments, museums, crafts, folklore, and traditional festive celebrations. Although space and environment should be considered as interacting factors, in some places the location of certain resorts can be largely explained in terms of environmental factors, while in other places location can be mainly attributed to space perse, related to market accessibility and other concentrations of economic activity (Burkart and Medlik 1986; Butler 1986; Cazes, Lanquar and Raynouard 1980; Defert 1954; Pearce 1981; Vera, López, Marchena and Antón 1997).

Climate is one of the geophysical elements that make up geographical space, contributing to the environmental conditions that facilitate or hinder human settlement. People seek to settle in those spaces that offer the greatest comfort and possibilities of survival in terms of climate. Tourism, as a human activity, is also governed by these same imperatives. Therefore, climate is an important criterion for locating tourism centers, helping to determine how an area is to be used. However, there is a general tendency among geographers to assume that climate is only important for locating tourism centers when the territorial scale of the phenomenon or the analysis is small (that is, study of a relatively large area). Thus, climate is often said to delimit optimal zones for tourism at a global and regional scale, as illustrated by the warm temperate zone, considered optimum for sun and beach tourism (Burton 1991; Callizo 1991; Lozato Giotart 1990; Vera, López, Marchena and Antón 1997). By contrast, other factors are believed to be more important in accounting for tourism development in places at a more local level.

Factors that have an influence at a local scale are different from those that account for global tourism zoning. Yet it cannot be concluded that climate is of no importance in large-scale analyses (detailed

investigations of small areas): an understanding of local climatology is becoming increasingly important in the study of tourism prospects (Billet 1975; Cazes, Lanquar and Raynouard 1980; Dauphine and Edelga 1971; Escourrou 1981, 1984; Makita and Kikuchi 1977; Renaudin 2002). Clearly, local climatology and the succession of different weather types influence the location of resorts, the calendar of tourist activities, the use and efficiency of the infrastructure, and the return on investments. Indeed, many resorts have prospered thanks to the ability to turn the favorable local climatic conditions to their advantage (Aguilar and González 1995; Barbier 1984; Becker 1998, 2000; Besancenot, Mounier and de Lavenne 1978; Dauphine and Edelga 1971; Escourrou 1980; Olcina and Vera 1998; Renaudin 2002; Vera 1985, 1987). Furthermore, at this scale, planning not only exploits the advantages of the climate, but also attempts to minimize or correct the possible excesses of certain climatic elements (wind, high temperature, sun hours) so as to create more benevolent microclimates that match tourists' expectations more closely (Besancenot 1991; Palomares 1964).

Conversely, tourism developers have excluded some areas because of their seemingly ''inclement'' weather that could not be readily countered. Elsewhere, because of the failure to consider the climate as a locational factor, certain resorts have not developed as hoped. The Catalan Pyrenees area (Spain) is a case in point: atmospheric parameters were not taken into consideration when choosing areas suitable for skiing, thereby causing some ski resorts to experience severe problems of operational and commercial viability (López 1996).

Climate as a Tourism Resource

When tourism makes use of a geographical space, it does so because there are certain constituent elements which, depending on how they are valued socially, can be exploited and subsequently incorporated into a tourism good or service. In this way, the elements of geographical space become resources and form the basis of any tourism development project. Without first analyzing them, any attempt at planning activities would be deficient. But the value of the space-resource varies with other

> essential circumstances, such as accessibility, the existence of initiatives to exploit the resource, legal and governmental regulations, the attraction of the landscape, etc. However, also and more significantly, the space will always be perceived in accordance with those *societal values* (tastes, fashions, etc.), diffused in advertising campaigns or in the mass media, that eventually impose on society how they represent the space (Valenzuela 1986:48).

This shows that fashion influences the type of resource used to form a product and, as a result, there may be a variation in the value afforded to it over time, reflecting social changes.

Climate is a natural tourism resource and it is an element that, thanks to human intervention, facilitates tourism and the satisfaction of demand (Table 1). Climate exists outside of any tourism project, but it becomes a resource when it is incorporated within a good or

Table 1. Climate as a Factor that Satisfies Tourist Needs

Maslow's Basic Needs	Tourist Needs	Climate as a Factor that Satisfies Tourist Needs		
		Low	Medium	High
Primary, Organic, Physiological Needs	Physiological and psychological needs			X
	Cultural needs	X		
	Need to change activity or geographical place			X
	Need for entertainment and relaxation		X	X
Safety Needs	Safety needs			X
Social or Affiliation Needs	Social and communication needs	X	X	
Esteem Needs	Status and prestige needs		X	X
Self-actualization Needs	Self-actualization needs		X	

service. The good is promoted for consumption and advertised via communication or commercialization channels, though it should always satisfy a latent need. Indeed, it is this need that induces the demand for the tourist to travel to the area. In this way, climate, a natural resource, is part of the tourism product.

Virtually all forms of tourism use natural resources to some extent: they all place a social value on the whole natural environment, that is, the climatic, geological, hydrological and landscape characteristics of a given space. Thus, ''a large part of modern-day tourism is based on the use of certain physical-natural characteristics that come together in a given space'' (Furió 1996:112). But developing an area does not normally rely on one single tourism resource; rather, it requires a wide range of resources and, in particular, natural ones. Climate can be either a basic or complementary resource. However,

> this natural resource *forms part of the contingency inherent in all that affects man*.... So, to ensure the success of a tourism resort, *good weather* is not sufficient. The climate is merely a prior condition: undoubtedly an important asset, a necessary condition, but in no case, a sufficient argument on its own (Besancenot 1991:15).

Furthermore,

> with identical potential, the essential determinants of tourism lie not so much in the attraction of the climate and the landscape but in the dominant social models of demand, in the local willingness to welcome tourists and to plan the sector, in the complex interplay of the multiple factors of travel (Cazes 1987:597).

Climate is a basic resource for various activities, which depend on the climate/weather to use Smith's (1993) terminology—which include sun and beach tourism, winter sports, health tourism, and water sports,

among others. Heliotropism is a fundamental argument that accounts, in its own right, for major movements of tourists: seeking and enjoying the sun is one of the main reasons why many tourists go away on holiday (WTO 2001). Similarly, winter sports depend directly on climatic resources: without snow or low temperatures for the artificial production of snow, the development of ski resorts would not have been possible. These and other examples show that the climatic elements exploited as resources today are the high number of sun hours, high temperatures, and snow. Other parameters, such as wind, have been rejected historically, although even these can be re-evaluated, as in the growth of gliding and wind surfing. Thus, new types of tourism have emerged, thereby turning previously rejected elements into the main ''raw material'' (basic tourism resource) of many recreational activities. This, in turn, has helped to transform marginal areas with these elements into important resorts.

A good example of this is Tarifa (Spain). Although it is located between two leading tourism areas, the *Costa del Sol* (Coast of Sun) and the *Costa de la Luz* (Coast of Light), and has magnificent beaches, as well as other natural resources and interesting monuments, tourism has not until recently been an important activity in the local economy. This area appears to have remained undeveloped because of the wind, an element traditionally not highly valued by tourists. In fact, there were few tourists to this coast before the 90s, but recent changes in needs and tastes and the establishment of new types of activities have given rise to a tourist boom in Tarifa: its wind allows for water sports, above all windsurfing. It has effectively put Tarifa on the world map: now known as the ''Capital of the Wind'' (or the ''Wind Machine''), it has changed beyond recognition. The wind has enabled the development of tourism, and the people who previously depended on the area's natural resources for fishing and agriculture have found a new source of prosperity in this business. As a result, it is no longer a forgotten enclave between the *Costa del Sol* and the *Costa de la Luz*, but has become integrated within the latter, and renamed the *Costa de la Luz y el Viento* (the Coast of Light and Wind) (Gómez Martín and López Palomeque 2001).

Climate (sun hours, temperature, snow, wind, etc.) is often the main resource upon which a whole series of activities designed to satisfy tourist demand depend. Elsewhere, however, climate merely complements other basic resources. In such cases, climate does not directly ''generate'' tourism but does facilitate its development, given that the climate and weather conditions allow or favor certain outdoor tourist or recreational activities (such as hiking, rafting, golf, hunting, fishing and climbing). To use Smith's (1993) terminology again, these are ''activities sensitive'' to the climate and weather.

Characteristics of Climate as Tourism Resources

Atmospheric elements, independently of whether they are basic or complementary tourism resources, are somewhat different in character

from other natural resources and these differences need to be considered when exploiting them. Thus, several factors should be borne in mind. One, climate is a free resource: it is so abundant that it needs no mechanism for allocating it or sharing it out. Given the nature of the resource, no conflicts arise from using it, unlike other scarce resources that are often the focus of tension. This is the case, for example, in Spanish Mediterranean areas, where agriculture and tourism fight over water and land.

Two, climate is a resource that cannot be transported or stored. The consumer must travel to a specific place to enjoy its climate. Thus, it is a natural element that has a ''fixed'' physical space and must be enjoyed *in situ* (Besancenot 1991). Hence, climate-dependent activities are linked to a particular geographical space that has certain atmospheric characteristics. For this reason, developers of tourism projects should undertake detailed studies of it and of the pattern of weather types in a place, in order to ensure that adaptation is optimum and that the resource is used appropriately.

As to the third factor, the distribution of the climate resource varies in space and time. Climate is not homogeneous over the earth's surface and is not a tourism resource (basic or complementary) in all places: there are climates that limit tourist activities and others, which favor them. But wherever this resource is to be found, ''it is subject to great temporal variations - from one day to the next, one season to the next and one year to the next'' (Besancenot 1991:15).

This variation from one day to the next means that it is virtually impossible to guarantee ''good'' weather, even though the choice of an enclave may be considered optimum in terms of its climate-tourism potential. It can cause major variations in use even on successive days: the number of visits for a given activity, particularly open-air ones, varies enormously from a rainy to a sunny day (Besancenot 1991). However, if the day-to-day variation is not too marked (that is, if the days of bad weather do not extend over too long a period), it has little effect on overall figures and the only apparent effect is the switch from outdoor to indoor activities (Besancenot 1991; Bettinger 2002; Perry 1972). Thus, resorts need to include activities that can be performed indoors, sheltered from the inclement weather, to guarantee customer loyalty even during bad weather. This would discourage the abandonment or sudden change of destination, or dissatisfaction, boredom, and the decision not to return.

As climatic conditions are decisive in drawing up the school and work calendars, seasonal variation in the climate has generated a strong concentration of the tourism offer and demand, although it is not the only factor affecting seasonality (Ramón and Abellán 1995). This has occurred most notably where tourism products are not highly diversified and are based largely on climate; seasonality is less notable in those places where the offer has been diversified, by adapting activities to the various weather types that appear during the year and by promoting open-air activities that rely on other basic resources. Increasingly, fear of seasonality is forcing centers and firms to make greater efforts to diversify, in an attempt to escape the ''single

cropping'' practices of the past (Crowe, McKay and Baker 1977). Finally, ''the variability in the weather from one year to another has repercussions on the number of visitors.... Migratory flows vary geographically depending on the vagaries of the climate'' (Besancenot 1991:19). In extreme cases, this interannual variation can bring about a shift in the orientation of tourist flows both in the short- and long-term: a particularly bad season can dissuade people from traveling to a region for two or three years (Besancenot 1991; Monferrand 2002).

Four, if such variations are examined, it can be seen that there are extreme weather events (such as cyclones, seasons of torrential rain or heavy snowfall, floods, heat waves, avalanches) that can endanger lives and threaten tourism infrastructure, resulting in major financial losses. For this reason, tourism potential studies also should be accompanied by studies of extreme weather events and associated response plans.

Further, five, when discussing climate, a set of parameters is referenced that make themselves manifest at the same time and which are interrelated and directly affect elements of the natural and human systems, including the economy. These parameters, in turn, impact tourists as individuals in physical (the case of rain and wind), physiological (the case of temperature and humidity), and psychological (the case of cloud cover, the intensity of the sun hours and fog) ways. These influences, which are manifest in multiple combinations, are not evaluated identically by everyone and, hence a complex explanatory variable has to be introduced, namely perception. It follows that the study of tourism potential should include its consumers (through surveys, interviews, or observed behavior) to complement the indices used in the earliest studies of tourism climatology (Burnet 1963; Clausse and Guérout 1955; Davis 1968; Flocas 1975).

Finally, six, climate has traditionally been considered as a special natural resource because it is renewable and nondegradable in the sense that the climate available next year cannot be affected by the amount of it used this year. This differs from other natural resources (such as water and flora) for which the quality and quantity available for the following year depend on the amount used in the preceding year. However, recent climate change studies have shown that certain human activities can modify the climate and weather, alter the resource, and alter today's tourism sites, affecting local and regional economies greatly (Breiling and Charamza 1999; König and Abegg 1997; König 1999; Maddison 2001; Scott and McBoyle 2001; Scott, McBoyle, Mills and Wall 2001; Wall 1992; Wall and Badke 1994). Thus, the most innovative studies on climate and tourism are those that examine how the industry should be adapted in the future and those that emphasize this as a key consideration in planning projects.

Climate as an Attraction

Climate can also be an attraction in itself and plays a decisive role in the selection of destinations. When tourists are thinking about buying

a product, they weigh up its different elements, such as resources, infrastructure, services, and price. The climate is also evaluated in this process, as it is a natural resource that usually forms a part of the product. This assessment influences the decision to purchase and is determined by a set of internal (perception, motivation, learning, personality, attitudes) and external (economic, social and cultural factors, social class, reference groups, family composition) variables, the purchasing behavior of tourists responding to both personal circumstances and to the influence of society. All of this, in turn, depends upon a person's way of being, thinking, and behaving (Aaker and Myers 1991; Gómez Martín 2000; Valls 1996). In this context, climate becomes a factor in attracting people when, as a result of these complex influences, it acquires greater importance than the other elements and is valued so positively that tourists decide to buy the product (recent studies show that the weather and climate, together with the level of safety and the sociopolitical situation in destinations, have most influence on tourists' choices (Maddison 2001; Monferrand 2002).

Advertisers are well aware of the importance of climate/weather in the decisionmaking process and introduce it quite explicitly in advertising, so that it forms part of the image of the tourism product or destination. The firms and agencies seek to create favorable opinions by transmitting messages that establish a clear market image. Yet, at the same time, they also try to show the tangible and intangible benefits of their products. The combined effect of these messages is to create an image of the product, firm, or destination in the minds of potential consumers. The image should make them believe that ''what they think of the reality is real and not an artificial representation of this reality'' (Chaves 1988 quoted in Valls 1996:206). Tourists aim to satisfy their needs and expectations based on the benefits, attributes, and functions manifest in these representations of reality (Miossec 1977). Tourism products and destinations do not in themselves satisfy; it is their projection in the form of an image which generates the experience and, becomes the image that underpins the decision to purchase. It also influences satisfaction and is what induces tourists to return to the destination (Valls 1996).

On occasions, these idealized representations created in the minds of the potential consumers have certain shared characteristics penetrating the collective consciousness and forming a myth. This latter expresses those aspects of the destination and product that most surprise or have the potential to surprise the tourists. Often the myth is simplified and trivialized eventually becoming a stereotypical image. These myths and stereotypes taking shape in people's minds (thanks to the various stimuli that they receive) have a considerable influence on their decisionmaking.

Frequently, although this depends on the destination, one of the most exploited myths used to attract tourists is that of climate. According to Besancenot, ''the iconographic analysis of tourist brochures and the careful reading of the accompanying text only confirm the obsessive presence of references, direct or indirect, to the climate''

(1991:208). Cazes, in addition to highlighting the importance attached to the climate in advertising, also referred to the way in which this is done. He pointed out that the climate boasted of often has little in common with the actual conditions:

> The image given is not always false, [but] the stereotypical photograph though is clearly taken at the best possible time of day and from the most favorable angle so as to cover up anything that might be a source of disappointment. . .. The advertiser, certainly, never creates a completely fictitious climate, but selects a number of elements which give the impression of paradise; they only offer us stereotypes (beaches, sun, blue skies, half-naked women) which recreate an image of the Garden of Eden and which trigger the stimuli for travel. Thus, while it is true that tourists have a vast range of reasons for going on holiday, they all share certain aspirations, and it is to these that the key words and images that fill the tourist brochures need to refer (Cazes 1975 in Besancenot 1991:208).

Chadefaud (1988), Escourrou (1980), Gómez Martín (1999, 2000), and Lanquar and Hollier (1986) have analyzed the way in which climate is used in the advertising of tour operators. These studies concluded that a high percentage of brochures contain references to it. Many of these extol the virtues of the climate, while others offer tables of quantitative data (largely monthly and annual means) referring to the air temperature and number of sun hours. Most resorts and regions manage to combine, with varying degrees of accuracy, idyllic descriptions and numerical values, in seeking to compose brochures that both attract tourists and provide a source of information. Indeed, studies (Monferrand 2002; Renaudin 2002; Williams, Dossa and Hunt 1997) show that tourist demands for information have changed considerably in recent years. Customers increasingly call for improvements in the quantity and quality of the information: the generalizations and mean values which conveyed the impression that a region's climate is spatially and temporally uniform have given way to more detailed analyses that include more climatic parameters, such as comfort indices and ultraviolet indices, and that provide such information as probability tables for different weather types and specific recommendations regarding safety. In fact, a number of recent studies (Bettinger 2002; De Freitas 2001) have highlighted the fact that the number of guests at certain resorts is partly attributable to two interconnected variables: climatic/meteorological conditions and the information regarding these given to the tourists.

Weather, Climate and Tourism Planning

Although, climate may act as a support, resource, locational factor, and attraction, the nature of these relationships requires closer analysis and the reasons why it has an influence on tourist planning need to be elucidated. But first, a number of conceptual questions should be clarified. Over the years, climate has determined whether a given zone is suitable for tourism: activities are organized within the context of the

prevailing climate(s) of that place. In the short term, however, weather determines the best moments for a particular activity or for programming a series of activities. For these reasons, it is apparent that the climate is experienced by tourists as weather.

Climate and weather have implications for tourism planning. First, climate affects the environmental context in which tourism can be undertaken: it is a key to vegetation patterns, morphogenetic processes, the distribution of fauna, and certain diseases, river flow, and water supply. All of these are vital to the development of an attractive and functional setting for tourism. For instance, one may consider the seductive power of lush, verdant, landscapes (due, in part, to certain climatic conditions) over tourists, in particular those accustomed to living in dry environments; or how hunters choose different natural environments according to the species they wish to hunt; or the ways in which tourists from the north of Europe see the Mediterranean resorts as a land of paradise.

Existing settings, both attractive to tourists and functional, may in the near future be modified as a result of global climate changes. Indeed, some studies already show certain symptoms that are of concern to the tourism industry. In the Mediterranean, one of the leading destinations with over 120 million tourists each year, there has been a marked increase in the number of heat waves. These have caused deaths among tourists and local populations (Conte, Sorani and Piervitali 2000; Katsouyanni 1988; Perry 2001). Similarly, marked declines in precipitation levels have had a severe impact on water reserves, giving rise to conflicts among different economic activities (Perry 2001; Wheeler 1995). These increases in temperature and drops in precipitation have left forests more vulnerable to fire, with a considerable rise in the number of forest fires over the last few years (Perry 2001; Pinol, Terradas and Lloret 1998). Likewise, the increases in air and sea temperatures favor the proliferation of certain organisms (such as mosquitoes, algae, and medusas) that pose a health threat and, consequently, affect the normal provision of tourism activities. The industry has reacted rapidly to these changes by increasing the amount of research being undertaken and by adopting measures that allow resorts to adapt to these changes. Examples include campaigns to raise awareness among tourists, providing them with more information, and changing the activity schedules.

Second, climate has a strong influence on the seasonality of tourism activities, while its degree for a tourist zone partly determines its profitability: long seasons mean the infrastructure and services are more extensively exploited and, consequently, allow a higher return on the capital invested. Favorable climatic conditions for a particular tourist activity usually occur in certain periods of the year. The seasonality problem can be exacerbated by activities poorly adapted to the climate or poorly diversified to suit the conditions recorded during the year. It is of greater importance when destinations are dependent on one activity and climate is promoted as one of the resources. It is even more significant when they depend on the climate rather than being merely sensitive to it. For example, cultural tourism has fewer problems

of seasonality given that the weather and the climate have limited influence on this activity. Other types of tourism, however, are highly affected because they promote climate as the main attraction, since it acts as a basic input into the creation of the product: this is the case of sun and beach tourism, health tourism, winter sports, water sports, and tourism linked to certain adventure sports.

But the seasonality of activities is not only linked to the temporal concentration of the offering; it also depends, albeit to a lesser degree, on the time-concentration of the demand. During the year, the climate largely determines when people work and when they go on holiday. These periods are usually established on the basis of the climatic requirements of the former, as extreme conditions make working arduous and, above all, highly unproductive. As such, only a detailed knowledge of the climate and an optimum adaptation of activities to it can ensure that seasonality (one of the problems causing most concern to the industry) is minimized. Daily evaluations of tourism potential, of varying degrees of complexity, over a series of several ten-year periods, could play an important role within the detailed understanding of it. They should consider the combination of atmospheric elements and perceptions and disseminate the results in intelligible graphic and cartographic images; this should help in drawing up activity schedules that ensure well-informed decisions for both tourism offer and demand.

Third, weather influences tourists and what and when (especially outdoor) activities can be carried out. The tourist desiring an activity should consider the weather when deciding whether the activity can be completed with satisfactory safety, enjoyment and comfort. Thus, for example, those interested in hunting will need to consider the day's weather conditions because the performance of their tracking dogs, the effectiveness of the hunters themselves, and the presence or absence of the prey will depend on elements such as temperature, wind velocity, sun strength, and rainfall. The wrong combination of these conditions may more than suffice to cancel the scheduled program. The same is true of other activities: a wet ground following heavy rain can cause accidents among those on a cycling holiday; a windy day might also make cycling, a round of golf, skiing, or swimming in the sea difficult; storms put a stop to almost all outdoor activities or, at the very least, make them very dangerous. On occasions, when faced by adverse weather conditions, tourists have to rethink their activities, abandoning outdoor in favor of indoor ones perhaps of a more cultural or social nature. So, knowledge of climate allows for general strategies, and knowledge of weather conditions allows for appropriate tactics to try to ensure that tourists have a good day. This is why weather information is so important: a resort's guests (and potential tourists) are usually attentive to forecasts and bulletins available in newspapers and on Internet, television and radio. The amount of media information has grown substantially in response to this growing need. Thus, weather data (especially the day's weather and the short-term forecasts for 24, 48, and 72 hours) are displayed in the tourism information centers of most resorts, as well as on the resort webpages. Similarly, the

general weather forecasts broadcast on all television channels seek to meet this need by offering (above all during holiday periods), information such as the temperature comfort index, the UV index, snow thickness, snow type, risk of avalanches, condition of the sea and water temperatures. Thus, it can be concluded that the quality of weather information helps to improve the quality of one's experience.

Fourth, a place's climate and weather are frequently presented as attractions in their own right. The climate can be a main appeal of an area, as shown by the popularity of many enclaves of the Mediterranean, Caribbean and Pacific, and the success of many ski resorts. However, the term ''good climate'' or ''good weather'' is entirely relative, as it depends on the activity tourists wish to engage in. Climate and weather considered optimum for skiing are quite different to those considered optimum for windsurfing or swimming in the sea. What might be considered a ''good climate'' by some is just the opposite for others.

While each activity requires its own particular climate and weather, there appears to be a particular predilection among tourists for sun and relatively high temperatures (environmental comfort): most seek to have a holiday in places characterized by gentle temperatures and plenty of sun. Thus, for example, for British tourists, climate (sun and pleasant temperatures) is basically the reason why they choose Spain as a destination: in 2000 those stating this reached 83% for January, February, and March; 85% for April, May, and June; 75% for July, August, and September, and 71% for October, November, and December (Instituto de Estudios Turísticos 2000). These same preferences can also be seen in other types of tourism: for example, skiers prefer sunny weather and pleasant temperatures to overcast with low temperatures. The latter would, in fact, be better to maintain the surface layer of snow needed to ski. Most tour operators, aware of these such preferences, incorporate climate within the brand image of the product: brochures are full of pictures and supporting written information (body of the text, statistical tables, slogans and headings) regarding the weather (Gómez Martín 1999), so as to appeal to tourists, as they know that this might influence the customer when choosing where to go on holiday.

This search for the sun is a relatively recent phenomenon among tourists, which shows that the way tourism resources are valued depends substantially on cultural factors and fashion:

> The stubborn pursuit of the sun, heat and a good sun tan that so inspires our contemporaries would have seemed quite incongruous in the last century. At that time the ladies were supposed to keep their skin as white as possible, if not diaphanous, and they sought shelter under a parasol whenever the sun came out. A sunburned skin, the mark of ''this ruddy health which is such a vulgar thing in our civilization'', as Teófilo Gautier wrote in his *Éloge de la poudre de riz* (1860), was something they left for their menfolk, and their calling to live in the open air of the fields, hunting or fishing (Besancenot 1991:16). No single climate in its own right has the ability to attract and hold on to the summer holidaymaker. If it did, in spite of everything, it could only be as a function of a certain idea that one might have of tourism and holidays, as regards a certain ideal climate and a given clientele.

> Such an ideal climate could only be the expression of a cultural system which mixes the sensibility, imagination, lifestyles, ways of thinking, and the values of a particular period or of a particular society. Relations, therefore, between tourism and climate are not immutable either in time or in space (Besancenot 1991:16).

Fifth, a high risk of climatic disaster (or natural catastrophes in general) is incompatible with any type of tourism activity. In analyzing any site, it is important to consider extreme events that might threaten the life and property of tourists, or services and infrastructure. Although absolute safety in activities can never exist, a sound tourism plan should take into account the risks of storms, winds, blizzards, and fog, to give just a few examples. However, failure to give due consideration to these elements often means that sites suffer greatly from climatic risks. The catastrophic nature of many events depends on the human uses of the geographical space. For example, tourists, lured by the location of services, often place themselves in areas that are at particular risk from the vagaries of nature. For example, many camp alongside rivers and run the risk of being the first victims of the slightest rise in the water level or the most modest of storms (Besancenot 1991). This is what happened in the basin of the Arás canyon (Aragon Pyrenees, Spain) on the evening of the 7 August 1996, when extraordinarily intense rainfall caused a massive landslide that destroyed everything in its path, including ''Las Nieves'' campsite located in the core of the canyon's debris. There were 87 deaths and vast destruction and material loss.

Sixth, climate and weather have a major influence on tourism complexes and infrastructure. They largely determine whether or not a region will be frequented by tourists and determine the type of stay and the types of accommodation and constructions built (Besancenot 1991; Monferrand 2002). Climate both determines the ideal type of accommodation (for example, cool wet climates are not the most appropriate in which to camp; hotel accommodation is less sensitive to the meteorological conditions than other forms) and has an influence on the architecture of the tourism complex. The type of construction should ensure occupants will enjoy comfortable and safe indoor environments. This can be achieved by carefully considering the weather of a place when designing the buildings and, when necessary, by installing artificial devices such as air conditioning. Suitable systems of ventilation and humidification, heating and cooling, and air conditioning are of little use if the floors, walls, and roofs do not have proper thermic and hydrometric insulation. But, what is more, the choice of appropriate materials for these purposes is not enough. The site, foundations, and the thickness, shape, color and orientation of the roofs and façades, the existence and dimensions of eaves, terraces, openings and patios must be rationally planned. This must be done by taking into consideration the normal values and the variations in elements such as sun intensity, temperature, humidity, rainfall, fog, snowfall and prevailing winds (Palomares 1964).

Architectural projects for tourism developments also need to take into account how important trees, bushes, and vegetation in general are in moderating certain types of weather: ''Since ancient times, lines

of trees have been used, for example, as exceptionally effective windbreaks, while in hot dry climates, gardens have been used for both their ornamental value and their cleansing and refreshing effects in inhabitable places'' (Palomares 1964:84-85). Similarly, the use of awnings, sunshades, and wooden outhouses should be considered in outdoor areas as they can contribute considerably to moderating certain atmospheric elements. In short, it is a matter of using both the knowledge and techniques that have been built up about the weather of a place to create comfortable, healthy climatic environments within the closed and open spaces that are frequented by the tourists.

Seventh, climate and weather have a major influence on whether transport and communication systems work smoothly and facilitate or confine tourists' mobility. This factor is undeniably important given that the definition of tourism requires movement in space. In addition, tourists have become increasingly more dynamic and, as a result, demand efficient systems of transport and communication that allow them to fulfill their objectives.

Weather and climate are frequently considered when planning airports, coastal infrastructure, and river navigation projects; however, they have been somewhat neglected when planning overland transport routes, mainly roads and railway lines (Palomares 1964). Yet elements such as temperature, humidity, rainfall, fog, snowfall, and winds should also be considered when planning different overland routes, in order to determine the possible weaknesses or diseconomies caused by road surface erosion (due, for example, to frequent frosts) and road closures (resulting from frequency of fog or the drifting of snow, for instance) and to be able to take the most appropriate measures to rectify the problems (such as route changes, provision of snow ploughs).

Eighth, climate and weather influence the tourists' enjoyment. Certain conditions can stimulate positive psychological reactions (such as optimism, euphoria, good moods) that can help to enhance the sensation of enjoyment. Conversely, weather conditions can make the generate negative psychological reactions (such as pessimism and bad moods). A number of studies (Campbell and Beets 1977; Cunningham 1979; Tromp 1974; Williams, Dossa and Hunt 1997) have highlighted the links between weather and human behavior. These links can be analyzed at various levels. At the symbolic level, different atmospheric conditions (in particular those associated with sun hours and temperature) are associated with the possibility of carrying out certain activities. At the aesthetic level, different atmospheric conditions produce chromatic and light variations that can be valued in terms of their aesthetics. At the physiological level, different atmospheric conditions trigger certain biological/physiological processes that can condition the individual's physical and mental state. Tourists, consciously or otherwise, usually chooses their holiday destinations by selecting so that all the elements of the product purchased, including its climatic elements, promote a sensation of enjoyment from symbolic, aesthetic, and physiological perspectives. Any atmospheric situation that differs from what was expected (idealized or wished for) can cause tourists

to feel unhappy, aggrieved or pessimistic and make them feel that they have squandered their short, expensive holiday.

Ninth, climate and weather combine to form environmental conditions that have a direct bearing on the tourists' perceptions of comfort (sense of well-being) and their health. The human body is constantly subjected to weather influences. To attain the biological balance needed for survival, the body has to fight against the aggressions of this environment. The more the weather differs from the optimum levels required to maintain homeostasis, the more organisms have to fight, which can give rise to feelings of discomfort. Climatic or meteorological conditions that generate constant situations of discomfort can convert an initially healthy state into a dangerous pathological condition. This is why tourists seek climates that can guarantee minimum levels of comfort and which pose no threat to their health (WHO 1966–1967).

While the demands for comfort and health are universal among tourists, for certain groups or types these demands are more important. Thus, elderly tourists often place great value on climate in terms of comfort and health, because they do not adapt as quickly as the young to the imbalances caused to their organism by brusque changes or extreme atmospheric conditions. Furthermore, at these ages, the risk of illness is much greater and extreme climatic situations aggravate illnesses. There are many examples of this at this period of life: the cases of heart attacks caused by brusque, marked variations in the chill effect of the air or gusts of violent winds (Besancenot 1986, 1991), the cases of brain vascular accidents during intense summer heat and humidity or winds charged with water vapor (Besancenot 1974, 1991), and cases of embolism following sharp drops in barometric pressure.

Health tourists also place considerable value on the climate in terms of comfort and health. In this type of tourism, the climate acts as the raw material that cures or prevents the appearance of certain illnesses. An example of this is thalasotherapy, the use of the properties of sea water and a coastal climate for curative purposes, particularly in treating lung complaints, such as tuberculosis or bronchitis, rickets and psoriasis (Escourrou 1980). Thus, while certain atmospheric conditions and elements can help to maintain or improve health, it is also true that the ill-advised use of these elements, owing to a lack of information or lack of care, can be particularly harmful. Perhaps the best known example of this is sun bathing, which can be beneficial if proper caution is exercised but which is particularly harmful when the sessions in the sun become abusive (leading to solar erythema, skin cancer, premature ageing of the skin, cataracts, macular degeneration, melanomas in the uvea, etc.). For this reason, in recent years, efforts have been made to make tourists more responsible when using certain atmospheric elements and to adopt healthier habits, sush as the ''Actúa contra el calor de la manera más fácil'' the campaign of the Health and Consume Ministry of the Spanish Government (2004). Information and awareness campaigns play an important role in achieving these aims.

Tenth, climate and weather influence the degree of satisfaction, allowing tourists to enjoy their holiday activities safely and comfortably,

helping them fulfill the desires that originally brought them to the resort and, consequently, raising their satisfaction levels. Thus, for example, a study of the degree of satisfaction expressed by both national and foreign tourists with the Spanish tourism product (Bardón 1991) shows that ''sun and the climate'' make one of the greatest impressions on tourists as regards needs' satisfaction: 89% of the replies given by Spanish tourists claimed that the climate and weather had made a good or very good impression on them (a very high level of satisfaction); among foreign tourists this percentage rose to 93.1%. This is significant for a number of reasons, especially the economic repercussions, since satisfaction should influence future visits: satisfied tourists tend to return to a resort, whereas dissatisfied tourists seek new destinations.

CONCLUSION

This article highlights the close relationship between climate, weather, and tourism, and shows the need to understand the nature of these relationships, in order that tourism planning might be more effective. Further, it asserts that tourism planning should incorporate more than simple, general descriptions of the climate, which are often unconnected to the needs of tourism. The analyses required should be more closely focused on the climatology of a particular space and linked to the many facets of tourism: the attractiveness and functionality of the destination; the seasonality of activities; the programming of activities; the safety of tourists and infrastructure in view of climatic risks; the design of accommodation and constructions; the mobility of tourists and the design of transport and communication systems; the enjoyment, comfort, and health of tourists; the level of satisfaction and the influence on future visits, among others. All these useful planning questions have to be considered under the dynamic paradigm of climatic change. For this to happen, the appropriate authorities have to improve their networks of meteorological observatories and provide better access to the information. Governments must carry out the general agreements emanated from Kyoto's Protocol. Furthermore, various agents playing roles in tourism must be made aware of the need to incorporate aspects of climate and weather into the design and development of their various projects. A

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